

WE CLAIM:

1. A phased array antenna comprising:  
a plurality of assemblies, each assembly including a plurality of elements and a plurality of digitally controlled centralized beam formers coupled to respective ones of the plurality of elements.
2. The phased array antenna of claim 1, wherein the centralized beam formers are disposed under the plurality of elements.
3. The phased array antenna of claim 1, wherein the elements comprise radiating elements and the digitally controlled centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a plurality of signals.
4. The phased array antenna of claim 3, wherein the digitally controlled centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a polarization.
5. The phased array antenna of claim 4, wherein the polarization further comprises a left-hand circular polarization.
6. The phased array antenna of claim 4, wherein the polarization further comprises a right-hand circular polarization.
7. The phased array antenna of claim 4, wherein the polarization further comprises a vertical polarization.

8. The phased array antenna of claim 4, wherein the polarization further comprises a horizontal polarization.

9. The phased array antenna of claim 1, wherein the elements comprise receiving elements and the digitally controlled centralized beam formers are operable to receive a signal from the respective ones of the plurality of receiving elements representative of a plurality of signals.

10. The phased array antenna of claim 9, wherein the digitally controlled centralized beam formers are operable to receive a signal from the respective ones of the plurality of receiving elements representative of a polarization.

11. The phased array antenna of claim 10, wherein the polarization further comprises a left-hand circular polarization.

12. The phased array antenna of claim 10, wherein the polarization further comprises a right-hand circular polarization.

13. The phased array antenna of claim 10, wherein the polarization further comprises a vertical polarization.

14. The phased array antenna of claim 10, wherein the polarization further comprises a horizontal polarization.

15. The phased array antenna of claim 1, wherein the digitally controlled centralized beam formers are coupled to the respective ones of the elements by equal lengths of cable.

16. The phased array antenna of claim 1, wherein each of the plurality of elements further comprise a horn, a polarizer, and a filter.

17. The phased array antenna of claim 1, wherein each assembly further comprises two centralized beam formers and a digital control module operably coupled to the two centralized beam formers.

18. The phased array antenna of claim 1, wherein each of the plurality of centralized beam formers further comprise an integrated circuit for receiving a phase shifted input representing a combination of inputs, for receiving beam forming commands, and for distributing the beam forming commands and the 5 phased shifted input to phase shifters and a control circuitry, and a combining network coupled to the integrated circuit.

19. The phased array antenna of claim 1, wherein each assembly comprises a row assembly.

20. The phased array antenna of claim 1, wherein each assembly comprises a quadrant assembly.

21. A phased array antenna comprising:  
a plurality of assemblies, each assembly including a plurality of radiating elements and a plurality of digitally controlled centralized beam formers coupled to respective ones of the plurality of radiating elements, the 5 centralized beam formers being disposed under the plurality of radiating elements and being operable to provide a first signal to the respective ones of the plurality of radiating elements representative of a plurality of signals for a first polarization and a second signal representative of a plurality of signals for a second polarization.

22. The phased array antenna of claim 21, wherein the polarization further comprises a left-hand circular polarization.
23. The phased array antenna of claim 21, wherein the polarization further comprises a right-hand circular polarization.
24. The phased array antenna of claim 21, wherein the polarization further comprises a vertical polarization.
25. The phased array antenna of claim 21, wherein the polarization further comprises a horizontal polarization.
26. The phased array antenna of claim 21, wherein the centralized beam formers are coupled to the respective ones of the radiating elements by equal lengths of cable.
27. The phased array antenna of claim 21, wherein each of the plurality of radiating elements further comprise a horn, a polarizer, and a filter.
28. The phased array antenna of claim 21, wherein the polarizer is operable to receive the first signal and the second signal.
29. The phased array antenna of claim 21, wherein each assembly further comprises two centralized beam formers and a digital control module operably coupled to the two centralized beam formers.
30. The phased array antenna of claim 21, wherein each of the plurality of centralized beam formers further comprise an integrated circuit for receiving a phase shifted input representing a combination of inputs, for receiving beam forming commands, and for distributing the beam forming

5 commands and the phased shifted input to phase shifters and a control circuitry, and a combining network coupled to the integrated circuit.

31. A phased array antenna comprising:

5 a plurality of assemblies, each assembly including a plurality of receiving elements and a plurality of centralized beam formers coupled to respective ones of the plurality of receiving elements, the centralized beam formers being disposed under the plurality of receiving elements and being operable to receive a first signal from the respective ones of the plurality of receiving elements representative of a plurality of signals of a first polarization and a second signal representative of a plurality of signals of a second polarization.

32. A row assembly for use in a phased array antenna comprising:

a plurality of radiating elements; and  
a plurality of centralized beam formers coupled to respective ones of the plurality of radiating elements.

33. The row assembly of claim 32, wherein the centralized beam formers are disposed under the plurality of radiating elements.

34. The row assembly of claim 32, wherein the centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a plurality of signals.

35. The row assembly of claim 32, wherein the centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a polarization.

36. The row assembly of claim 32, wherein the centralized beam formers are coupled to the respective ones of the radiating elements by equal lengths of cable.

37. A row assembly for use in a phased array antenna comprising:  
a plurality of receiving elements; and  
a plurality of centralized beam formers coupled to respective ones of the plurality of receiving elements.

38. The row assembly of claim 37, wherein the centralized beam formers are disposed under the plurality of receiving elements.

39. The row assembly of claim 37, wherein the centralized beam formers are operable to receive a signal to the respective ones of the plurality of receiving elements representative of a plurality of signals.

40. The row assembly of claim 37, wherein the centralized beam formers are operable to receive a signal to the respective ones of the plurality of receiving elements representative of a polarization.

41. The row assembly of claim 37, wherein the centralized beam formers are coupled to the respective ones of the receiving elements by equal lengths of cable.

42. A satellite system comprising:
  - a satellite;
  - a phased array antenna disposed upon the satellite, the phased array antenna including a plurality of assemblies, each assembly having a plurality of elements and a plurality of centralized beam formers coupled to respective ones of the plurality of elements.
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43. The system of claim 42, wherein the centralized beam formers are disposed under the plurality of elements.
44. The system of claim 42, wherein the elements comprise radiating elements and wherein the centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a plurality of signals.
45. The system of claim 44, wherein the centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a polarization.
46. The system of claim 42, wherein the elements comprise receiving elements and wherein the centralized beam formers are operable to receive a signal to the respective ones of the plurality of receiving elements representative of a plurality of signals.
47. The system of claim 46, wherein the centralized beam formers are operable to provide a signal to the respective ones of the plurality of radiating elements representative of a polarization.
48. The system of claim 42, wherein the centralized beam formers are coupled to the respective ones of the elements by equal lengths of cable.

49. A method for distributing signals to a radiating element of a phased array antenna comprising the steps of:

(a) generating a first signal representative of a plurality of signals of a first polarization at a centralized beam former; and

5 (b) distributing the first signal to the radiating element.

50. The method of claim 49, further comprising the steps of generating a second signal representative of a plurality of signals of a second polarization at the centralized beam former and distributing the second signal to the radiating element.

51. The method of claim 49, wherein the first polarization further comprises a left-hand circular polarization.

52. The method of claim 49, wherein the first polarization further comprises a right-hand circular polarization.

53. The method of claim 50, wherein the second polarization further comprises a vertical polarization.

54. The method of claim 50, wherein the second polarization further comprises a horizontal polarization.

55. The method of claim 49, wherein the radiating element is disposed in an assembly.

56. The method of claim 49, wherein the centralized beam former is disposed under the assembly.

57. A method for distributing signals to a radiating element of a phased array antenna comprising the steps of:

- (a) generating a first signal representative of a plurality of signals of a first polarization at a centralized beam former;
- 5 (b) distributing the first signal to the radiating element;
- (c) generating a second signal representative of a plurality of signals of a second polarization at the centralized beam former; and
- distributing the second signal to the radiating element.

58. The method of claim 57, wherein the first polarization further comprises a right-hand circular polarization.

59. The method of claim 57, wherein the first polarization further comprises a vertical polarization.

60. The method of claim 57, wherein the second polarization further comprises a left-hand circular polarization.

61. The method of claim 57, wherein the second polarization further comprises a horizontal polarization.

62. The method of claim 57, wherein the radiating element is disposed in an assembly.

63. The method of claim 62, wherein the centralized beam former is disposed under the assembly.